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ABSTRACT

Thirty-one critical questions about asbestos, its use in school buildings, and the risks it poses to health are answered in this booklet. Issued by the Safe Buildings Alliance, an incorporated association of manufacturers that once supplied asbestos-containing materials for building construction, the booklet's purpose is to provide information that will enable decision-makers to come to scientifically sound decisions concerning whether to regard asbestos-containing materials currently present in school buildings as a threat, and if so, how to deal with that threat safely. The questions concern how to identify asbestos-containing products, how to assess the threats they pose, when to repair and when to remove asbestos, what asbestos is, what normal levels of exposure are, why and how widely asbestos has been used, what diseases are associated with asbestos exposure, and who has corroborated the findings reported here. (PGD)

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ASBESTOS IN BUILDINGS

EA 017 801

Introduction

Concern about the presence of asbestos in buildings, including schools, is widespread. Because prolonged exposure to high levels of asbestos has been linked with such diseases as asbestosis, lung cancer and mesothelioma, there appears to be a general public attitude that any asbestos in schools or other buildings represents an immediate threat to human safety. *Unfortunately, this attitude has often led to hasty, unnecessary and even dangerous asbestos removal activities.*

In fact, the real issue is identifying the few buildings where significantly damaged asbestos-containing materials might pose a risk of very high asbestos exposures to occupants. Therefore, the key challenge facing those responsible for dealing with the asbestos issue is understanding the facts and making scientifically-sound decisions.

The Safe Buildings Alliance shares the public's concern for safe, appropriate and timely action regarding asbestos in buildings. To help you understand this important issue, the Alliance has developed this booklet. It describes available scientific knowledge concerning asbestos in buildings and provides answers to the important questions.

The Safe Buildings Alliance is an incorporated association of manufacturers that previously supplied asbestos-containing materials for building construction. Alliance members are aware of and sensitive to the public's concern and need for accurate information on this emotional and often misrepresented issue. Along with other concerned citizens, community leaders and government officials, Alliance members are advocating:

1. Practical alternatives to the dangerous process of indiscriminate removal of asbestos-containing products.
2. Adoption of uniform standards governing abatement of asbestos-containing products in buildings, including the determination of acceptable exposure levels.
3. Development of a responsible inspection process to evaluate asbestos in building problems.
4. Establishment of a sensible training and certification program for inspectors and contractors involved in corrective actions.

For further information on asbestos in buildings, write the Alliance at: 655 Fifteenth Street, N.W., Suite 1200, Washington, DC 20005; or call: (202) 879-5120.

Assessing Asbestos in Your Buildings

Q.

What should be done about the asbestos-containing materials that may be in your building?

A.

Most asbestos-containing products in buildings will not release substantial numbers of fibers, and risks to occupants will be insignificant. Hasty corrective actions have often been found to increase exposures and have increased risks. Thus, owners of buildings with asbestos-containing products should seek expert advice.

These experts would help to identify asbestos-containing materials, assess airborne exposure levels and the potential for release of asbestos fibers, and determine if any action is appropriate. To ensure valid, independent advice, experts chosen to identify problems and to propose corrective measures should not be affiliated with contractors offering to perform removal or similar services.

Q.

How can you identify asbestos-containing materials?

A.

There has been confusion about which materials contain asbestos. Building owners concerned about the presence of asbestos should first

take core samples of friable products suspected of containing asbestos. These should be analyzed by polarized light microscopy or X-ray diffraction, or both, to determine their content. Competent laboratories capable of making such analyses can be found in major cities.

Q.

When asbestos-containing products have been clearly identified, what is the next step?

A.

Because the mere presence of asbestos-containing materials creates no hazard, building owners should determine whether asbestos-containing products are releasing fibers. The best way of finding what exposures exist is to monitor airborne asbestos levels. Given the extremely low levels of asbestos typically found in buildings, it is difficult to get accurate air level readings. *Only experts are qualified to make such determinations.*

Q.

What are the most important steps that building managers can take to control asbestos exposure?

A.

Independent experts believe that in most cases asbestos exposure can be properly controlled by a combination of minor patching or repairs, improved custodial control and special maintenance procedures.[16,20,30] Where small areas of asbestos-containing materials have been damaged such that fiber release may be possible, simple patching with readily available commercial compounds will reseal the asbestos fibers. Such

procedures can be applied, for example, to cementitious ceiling materials and pipe and boiler insulation.

Easily implemented maintenance procedures are also effective in controlling exposure to asbestos fibers. Custodial personnel should know the location of asbestos-containing materials and be instructed in the use of wet cleaning and other methods (including proper disposal). In some cases, HEPA vacuum cleaners should be used to properly clean up asbestos fibers.

Building managers also should ensure that maintenance workers, such as electricians or plumbers, do not inadvertently disturb asbestos-containing materials and that they use proper work practices when such materials are involved.

Combined with periodic inspection, these simple precautionary measures can simply and inexpensively protect both building occupants and workers from asbestos exposures of concern.

Q.

Are there some circumstances in which custodial control of the asbestos-containing material is not the best option?

A.

In those rare circumstances where airborne fiber concentrations are very high and cannot be lowered by the simple custodial and maintenance procedures discussed above, other control techniques may be appropriate. Encapsulation for some products using commercially available sealants or coatings (particularly those studied and recommended by the Battelle Institute in a study sponsored by the U.S. Environmental Protection Agency [EPA]) can be an effective control measure, as can enclosure of asbestos-containing materials in some circumstances. Removal—the method recommended by most asbestos abatement contractors—should be used as a last resort. There are few qualified contractors who will assure a safe removal and disposal. Also, removal is the most costly method in terms of meeting established EPA and U.S. Occupational Safety and Health Administration (OSHA) regulatory standards, and, most importantly, removal often results in increased fiber release, even when careful work practices are followed.[15,21]

Q.

Does that mean that removing asbestos-containing materials is usually more dangerous than maintaining them in place?

A.

Yes. Many experts believe that removing asbestos-containing materials in buildings often does more harm than good.[9,17,19,30] Very recently, the New Jersey Department of the Public Advocate reported that:

> *Improper asbestos removal places workers, building occupants, teachers and especially children at risk of serious health injury. It is well documented that the improper removal of asbestos can be far more hazardous than if the asbestos is not removed at all.*[16]

Very few contractors are qualified to conduct removal work properly, and the demand for their services far outweighs the few available qualified contractors. Many independent experts who have studied the situation have found asbestos fiber levels in buildings to be higher *after* materials were removed than before removal.

The Congressionally-chartered National Institute of Building Sciences reached similar conclusions:

> *There is some evidence to indicate that removal of asbestos-containing building products from schools and other facilities may be counterproductive. Whether the removal process involves dry or wet disruption of the in-place asbestos, data shows that a substantial quantity becomes resuspended and recirculated throughout the building. Following removal, weeks and sometimes months must pass before ambient air levels of friable* [crumbling] *asbestos fiber drop below acceptable levels.*[26]

Q.

What are the most important points to remember about asbestos-containing products in buildings?

A.

The mere presence of asbestos-containing materials in a building is no cause for alarm. Everyone is exposed to asbestos every day from a variety of sources. While high levels of asbestos exposure, such as those experienced by workers years ago, can sometimes lead to serious disease, the low levels found in the ambient atmosphere and in some buildings should not be a cause for concern.

Once an expert laboratory has confirmed the presence of asbestos-containing materials, building owners need to obtain qualified independent advice specific to their building. In most cases, a simple and inexpensive program of patching and special custodial and maintenance procedures will keep asbestos levels under control. Removal of asbestos-containing materials should be a last resort, primarily because of the high likelihood that asbestos fiber levels will be increased after materials are removed.

Important Information About Asbestos

The information on the following pages is essential to understanding why experts agree that very low-level asbestos exposures do not pose significant health risks.

1. The widespread natural occurrence of asbestos
2. Uses of asbestos
3. Asbestos and health

The Widespread Natural Occurrence of Asbestos

Q.

What is asbestos?

A.

The term "asbestos" refers to a unique group of minerals that are widely useful because of their special properties. Asbestos minerals are fibrous silicates with a crystalline structure and are found in rock formations throughout the United States and the world.[3] However, concentrations high enough to make commercial mining practical exist only in certain locations. As a result of both natural occurrence and commercial use, asbestos is commonly found throughout the United States in water supplies and in outside and indoor air.

Q.

How are people usually exposed to asbestos?

A.

Human exposure to asbestos may be caused by air, wind and water erosion from naturally-occurring deposits as well as by the mining, manufacture and use of some asbestos-containing products. Asbestos concentrations exceeding those permitted by the government in work-places have been recorded in natural dustfall along roads in some areas.[4]

Drinking water from areas of asbestos-containing rock has been found to contain hundreds of millions of naturally-occurring asbestos fibers per liter.

Q.

Is asbestos exposure an everyday occurrence?

A.

People are regularly exposed to asbestos. The U.S. Environmental Protection Agency, in broad samples of local water supplies, detected naturally-occurring asbestos in nearly three-fourths of all U.S. water systems. More than 15 percent had greater than one million fibers per liter (or more than 250,000 fibers per eight-ounce glass).[11] The U.S. Department of Health, Education and Welfare reported that in 20 U.S. cities, airborne asbestos concentrations ranged up to 0.007 fibers per cubic centimeter (fibers/cc) and averaged 0.0006 fibers/cc.[6] Very recently, the National Academy of Sciences concluded that the average outside air concentration throughout the United States is 0.0004 fibers/cc.[13] What these rather complex figures mean simply is that people are exposed daily to asbestos without developing asbestos-related diseases.

Q.

Can people avoid exposure to asbestos?

A.

Asbestos exposure is unavoidable, given its widespread natural occurrence in air and water. Asbestos fibers have been found in lungs and other tissues of the general population. Analyses of normal healthy adult lung tissues from persons who have not been exposed in the workplace have found that average lungs contain millions of asbestos fibers.[3] These findings indicate how pervasive asbestos is in our environment. Eliminating all exposure to asbestos is impossible.

Q.

Do these routine exposures endanger the public?

A.

Because the concentration of asbestos fibers occurring in the environment generally is at low levels, numerous governmental and scientific groups, including the *National Academy of Sciences*, *Commission of European Communities*, and the *International Agency for Research on Cancer*, have concluded that low level exposures do not pose significant public health risks. While not concerned about low, everyday asbestos exposures, these groups have advocated stringent workplace controls on asbestos mining, manufacture and product installation, where much higher exposures can occur.[2,7,10,12,14,20]

In the case of schools and other buildings, the EPA has yet to make a clear determination of what potential exposures exist and whether scientific information indicates such exposures pose any significant public health risk.

Uses of Asbestos

Q.

Why was asbestos used?

A.

For many years, asbestos was called the "magic mineral" because of its unique nature and widespread usefulness. The word itself comes from the Greek word for incombustible. The mineral's fire retardant qualities are among its most valuable characteristics. This led to its wide use in ships, buildings and theater curtains, where protection against fire was essential. In addition to its fire retardant properties it has other qualities which make it useful, including: a fibrous nature, heat stability, thermal and electrical resistance, flexibility, high tensile strength and stability in acids or alkalis.[31] Untold thousands of lives have been saved by the use of asbestos.

Q.

How widely was asbestos used in the United States?

A.

Asbestos has been used extensively. Asbestos consumption jumped dramatically in the United States during World War II, because of the Navy's determination that it was an essential component of shipboard fire protection.[32] Up until 1976, it was required by model building codes in specific areas of buildings where protection against fire was essential. In 1973 and again in 1978, however, the EPA prohibited certain spraying of asbestos-containing materials as part of its air pollution regulations.[8]

Q.

Is asbestos still used in the United States?

A.

Because of its unique properties, asbestos is currently used in hundreds of products including vehicle brakes, roof shingles, building panels, water and sewer pipes, roof coatings, floor tiles, electrical insulating materials, specialized thermal insulation, elevator brakes, and protective aprons and gloves.

Q.

Does the mere presence of asbestos-containing products pose a significant risk to building occupants?

A.

No. The presence of an asbestos-containing material will not, of itself, pose any hazard to building occupants. No risk occurs unless a significant number of respirable asbestos fibers are released from the material and enter the building air supply. The Environmental Protection Agency, in a document entitled "*Sprayed Asbestos-Containing Materials in Buildings*," has found that most asbestos products "have effectively immobilized the asbestos fibers by mixing them into a strong binding material."[22]

Q.

What are some examples of asbestos-containing products found in buildings?

A.

The following table indicates the purpose and general location of such product types.

Product Type	*Purpose*	*Generally Found*
Acoustical	Sound Control	Ceilings in Classrooms, Halls, Multi-purpose Rooms
Thermal Insulation	Safety-Energy Conservation	Pipes and Boilers
Steel Fireproofing	Fire Protection	Covering Structural Steel
Asbestos Cement Board	Fire Protection	Near Furnaces and Boilers
Tile and Sheet Flooring	Cleanability-Decor	Floors, Classrooms and Halls
Textiles	Fire Protection	Auditorium Curtains, Laboratory Aprons and Gloves

Q.

What type of asbestos-containing materials have caused the greatest concerns?

A.

Most concern about asbestos in buildings relates to certain materials that release fibers in large quantities. Over the years asbestos-containing products have been classified as both cementitious and dry-applied materials. Cementitious products are less likely to release fibers because they are bonded into non-asbestos materials. Dry-applied materials are not as well-bonded into other materials. As a result, they can have a higher potential for fiber release when disturbed.[20] Even such potentially friable materials will not normally release fibers in significant numbers if they are undamaged, well-maintained or wrapped in protective coverings.

Q.

What levels of airborne asbestos fibers have actually been found in buildings?

A.

Numerous studies, including those conducted by the EPA and the Ontario Royal Commission, have monitored asbestos levels in buildings constructed with these materials. In many cases, airborne levels have been so low as to be indistinguishable from outside air. In some, measurements show levels that exceed outside air levels by small amounts, and in only a few, measurements have significantly exceeded outside levels. But even at the highest levels, exposure is substantially lower than the Occupational Safety and Health Administration standards.[1,18,19,24] The Ontario Royal Commission concluded the "majority of exposures of building occupants in buildings with substantial amounts of friable asbestos would be to fibre levels less than 0.001 f/cc (fiber/cc), with a few single readings as high as 0.01 f/cc representing the highest likely exposure."[20]

Q.

How do airborne asbestos fiber levels in buildings and outside air compare to the levels associated with the workplace, and to existing government standards?

A.

Exposure levels in a typical building with asbestos-containing materials are tens of thousands of times less than historical asbestos worker exposures, as illustrated in the table on the next page.

It is highly unlikely that building exposure levels will rise as high as present OSHA standards for the workplace and most certainly not as high as levels associated with historical asbestos worker exposures.

	Representative Average Asbestos Exposures
Unregulated Workplaces (Historical)	20 or more f/cc
Workplaces Today	Up to 2.0 f/cc
Typical Building with Asbestos-Containing Materials	Up to 0.0009 f/cc
High Outside Air Readings	0.0007 f/cc
Outside Air	0.0004 f/cc

Q.

Will prolonged exposure to even low levels of asbestos fibers in a building (such as a school) cause a substantial health risk?

A.

No, because cumulative exposures are also very low. As the following table illustrates, a representative lifetime exposure from outside air would be 20 times higher than exposure over 10 years in a school building. The school building exposure would be but 1/100,000th, or 0.001%, the exposure that a typical worker has been found to have in an historical asbestos workplace.

Representative Lifetime Asbestos Exposures

	Level in Fibers/cc	*Years of Exposure*	*Days/ Week*	*Hours/ Day*	*Weeks/ Year*	***Total Lifetime* Fiber Hours***
Unregulated Workplaces (Historical)	20	30	5	8	50	**1,200,000**
OSHA Standard	2	45	5	8	50	**180,000**
Proposed OSHA Standard	0.5	45	5	8	50	**45,000**
Outside Air	0.0004	70	7	24	52	**245**
Typical School With Asbestos-Containing Materials	Less than 0.0009	10	5	6	36	**Less than 11**

*Scientists often express cumulative asbestos exposures in fiber-years; one fiber-year of exposure can be caused by one year exposure at 1 fiber/cc or 10 years exposure at 0.1 fibers/cc.[20] The table expresses the same concept, but in terms of hours of exposure for ease of understanding the comparisons.

Even in that rare school where exposures might average 0.01 asbestos fibers/cc, a student attending for 10 years would experience a total of 108 lifetime fiber hours—less than one-half the exposure typically received over a lifetime breathing outside air.

Q.

During which periods of school construction were asbestos-containing products used?

A.

Asbestos-containing products were most widely used in school construction from the period immediately following World War II to the early 1970's. These products were used to ensure safety and often were mandated by building codes and municipal regulations.

Q.

If an asbestos-containing product is found in a building, wouldn't it be best just to remove it?

A.

No. Some activities that disturb asbestos, *especially removal*, can cause high fiber release and consequent human exposure. Numerous studies have found airborne asbestos levels in buildings to be higher *after* removal activities than *before*.[1,17,19] The Congressionally-chartered National Institute of Building Sciences recently reported on cases where removal increased the risks:

> *[S]ome poorly performed asbestos removal and abatement work actually led to increased airborne asbestos levels in the building. There were also reports of cases where stable asbestos was disturbed during abatement resulting in airborne asbestos where it had not*

been previously...[I]t is clear that poor abatement practices may exacerbate existing conditions rather than solve the problem.[15]

Robert N. Sawyer, M.D., one of the country's recognized experts on asbestos risks and corrective actions, recently warned the EPA:

In contrast to the nonexistent or negligible exposure of typical building occupants, removal operations are certain to disturb asbestos-bearing materials and release significant numbers of fibers.... Unqualified contractors and untrained workers are more likely to aggravate the risk than to correct it.[30]

Q.

Does that mean, then, that some removal taking place today may create a serious risk?

A.

Yes. Many current contracts for asbestos removal call for achieving post-removal exposure levels below 0.01 fibers/cc. Because almost all buildings have even lower levels before removal, the potential for causing contamination is high.

A report issued by the State of New Jersey Department of the Public Advocate concluded: "It is well documented that the improper removal of asbestos can be far more hazardous than if the asbestos is not removed at all."

Further, the report stated that any proposal for removal, containment or management of asbestos, "must also ensure that the short-term solution of immediate removal of asbestos does not create even greater dangers for the children in our schools."[16]

Asbestos and Health

Q.

What diseases are associated with asbestos exposure?

A.

Numerous studies of workplace exposures in occupational environments have linked asbestos with three diseases: asbestosis, a fibrotic lung condition; lung cancer; and mesothelioma, a rare cancer of the surface linings of lung or abdomen tissues. The studies have also found that the lung cancer risk from asbestos exposure is closely related to individual smoking habits, with very few lung cancer cases found among non-smokers.[20,25,31]

Q.

Even though workers in the historical workplace were exposed to very high levels of asbestos, doesn't any exposure to asbestos pose a serious health risk?

A.

No. Studies of heavily exposed workers reviewed by the *National Academy of Sciences*, the *Commission of European Communities*, the *U.S. Consumer Product Safety Commission's Chronic Hazard Advisory Panel on Asbestos* and others have uniformly found that as exposure decreases, disease decreases.[2,3,13,20] Such dose-response relationships are typical of our environment. The general population is exposed daily to many

agents linked with cancer—radiation from sunlight, the fungus aflatoxin in milk and peanut butter, saccharin in food and beverages—at such low levels that little or no disease is expected.

Q.

How, then, can the risks of low levels of exposure be determined?

A.

They can't. At best, only estimates called "risk assessments" can be made. Government agencies often estimate low level risks by extrapolating from risks found for much higher exposures.

In order to ensure that risks are not underestimated, risk assessors *assume* that risk will occur at any exposure and *further assume* that low exposures are proportionately as hazardous as high exposures. For example, one-tenth the exposure is assumed to pose one-tenth the risk. Based on such assessments, government agencies have developed upper limit estimates of the risks of low level asbestos exposures.

Q.

How do the government's risk assessments for typical buildings with asbestos-containing products compare with other risks of everyday life?

A.

In order to understand the risks predicted for low level asbestos exposures, those risks can usefully be compared to the risks of a number of other everyday activities.

Based on EPA estimates, the risk experienced by attending a school with 0.001 fibers/cc average asbestos exposures for 10 years would be equivalent to the risk a person would experience smoking five cigarettes, or living in a brick building for seven months.[5,29,33]

Activities Posing Risks Equivalent to the EPA's Predicted Risk from 10 Years of Exposure to Asbestos in a School Building

	Average School Exposures of 0.001 Fibers/cc
Riding in a motor vehicle a total of:	1,000 miles
Smoking in a lifetime a total of:	5 cigarettes
Living with a smoker for:	7 months
Radiation from living in a brick building for:	7 months

Moreover, a person would need to attend a school with an average exposure of 0.001 fibers/cc for 40,000 years to face the same risk as is posed by smoking one cigarette a day for a lifetime. Similarly, only if a person attended such a school for 225 years would the risk even equal the risk of breathing the asbestos typically found in the outside air.

Q.

Does this mean that the public should not be concerned about any asbestos exposure in buildings?

A.

Not at all. It suggests that the sense of urgency felt by many is unwarranted. It is important to remember that the degree of risk in a representative school built with asbestos-containing materials is comparable to, or less than, the risks inherent in a wide variety of everyday activities. And, it is well below the predicted risk from asbestos exposure from the general environment. Even in the rare school with average exposures of 0.01 asbestos fibers/cc, many everyday activities pose a much greater risk.

Q.

Is this the opinion of a selected few or has it been corroborated by other scientific experts and governmental bodies?

A.

A number of expert governmental and scientific bodies around the world have concluded the risk of disease from exposure to asbestos in buildings is not significant. For example, the 1979 report of the United Kingdom (U.K.) Advisory Committee on asbestos, concluded:

> *[U]nless contaminated buildings are very much commoner than seems likely, no appreciable mortality from lung cancer can be associated with any degree of contamination by chrysotile [asbestos] likely to be encountered in the U.K. in the ambient air or in buildings not under active construction or repair.*[31]

The 1984 report of the Ontario Royal Commission on asbestos similarly said:

> *[W]e deem the risk which asbestos poses to building occupants to be insignificant and therefore find that asbestos in building air will almost never pose a health hazard to building occupants.*[20]

These conclusions have been echoed by numerous independent scientists. Julian Peto of Oxford University, a member of the U.S. Consumer Product Safety Commission Chronic Hazard Advisory Panel on Asbestos, and a strong advocate of stringent occupational regulation of asbestos, described the risk from asbestos in school buildings as "negligible."[28]

The State of New Jersey's Asbestos Policy Committee concurred explicitly with the Ontario Commission's conclusion, noting further[9]:

> *As of this date, there are no documented cases of lung cancer associated with low-level asbestos exposure over a lifetime. Risk assessment models used to estimate the incidence of cancers from low exposures to hazardous substances predict very low levels. For example, the lifetime risk of cancer associated with nonoccupational exposures to asbestos was found to be from 1,000 to 10,000 times less than the risk due to tobacco smoking alone.*

Professor Hans Weill, M.D. of Tulane University, who has often served as a government consultant on asbestos risk, reached similar conclusions. Asked his opinion of the risk to "schoolchildren in an environment where the asbestos is fixed and it's not friable and loose," Dr. Weill responded that the risk "would be very, very low; if not non-existent."[27]

Q.

Some claim that children are at greater risk from asbestos exposure than adults. Is this true?

A.

There are no studies documenting any greater risk to children, as compared to adults. Upon reviewing the available information, the Ontario Royal Commission concluded:

> [E]ven allowing for the hypothesis that the very young might be more susceptible to asbestos disease, the health risk to children remains insignificant because the level of exposure in asbestos-containing schools has in general been so low.[29]

The information contained in this booklet is designed to serve as a basis for understanding the complex issue of asbestos in buildings. If you have further questions regarding this issue, please write or call:

Safe Buildings Alliance
655 Fifteenth Street, N.W.
Suite 1200
Washington, DC 20005
(202) 879-5120

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References

1. Chatfield, E., "Relevance of TEM Analyses to Ambient Air Control Limits."
2. Commission of the European Communities, *Public Health Risks of Exposure to Asbestos* (1977).
3. Consumer Product Safety Commission, *Chronic Hazard Advisory Panel on Asbestos* (July 1983).
4. Cooper, W.C. *et al.*, "Chrysotile Asbestos in a California Recreational Area," 206 *Science* 685-88 (Nov. 9, 1979).
5. Crouch, E. & Wilson, R., "Estimates of Risks," 2 *Journal of Bus. Admin. U. of Bc Col.* 299-317 (1979-80).
6. Dept. of Health, Education and Welfare, "Asbestos: An Information Resource," Pub. No. 78-1681 (May 1978).
7. Doll, R. and Peto, R., "The Causes of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today," 66 *J. NCI* 1191-1308 (1981).
8. EPA, National Emission Standards for Hazardous Air Pollutants, 38 Fed. Reg. 8820 (April 6, 1973).
9. Goldstein, J. Richard, M.D., *Asbestos Policy Committee's Interim Report to the Governor* [of New Jersey] (September 1984).
10. International Agency for Research on Cancer, *Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man*, Vols. 2 and 14 (1973 and 1977).
11. Millette, J.R. *et al.*, "Asbestos in Water Supplies of the United States," 53 *Environ. Health Perspect.* 45-48 (Nov. 1983).
12. National Academy of Sciences, *Asbestos: The Need for and Feasibility of Air Pollution Controls* (1971).
13. National Academy of Sciences—National Research Council, *Nonoccupational Health Risks of Asbestiform Fibers* (1984).
14. National Academy of Sciences Safe Drinking Water Committee, *Drinking Water and Health* (1977).
15. National Institute of Building Sciences, Task Force Report, "Asbestos in Schools and Public Buildings" (July 2, 1984).
16. New Jersey Department of the Public Advocate, "Asbestos in the Schools: An Interim Report," testimony for presentation to the State Asbestos Policy Committee (Aug. 29, 1984).

17. Nicholson, W., Environmental Protection Agency, *Health Effects Update* (June 1983), referencing study of Sebastien.

18. Nicholson, W.J. *et al.*, "Asbestos Contamination of the Air in Public Buildings," EPA-450/3-76-004 (Research Triangle Park, NC: Environmental Protection Agency, October 1975).

19. Pinchin, D.J., "Asbestos in Buildings," Royal Commission on Asbestos Study Series, No. 8 (1982).

20. *Report of the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario* (1984).

21. Sawyer, R.N. *et al.*, "Airborne Fiber Control in Buildings During Asbestos Material Removal by Amended Water Methodology," (Dec. 1983).

22. Sawyer, R.N. & Spooner, C.M., "Sprayed Asbestos-Containing Materials in Buildings: A Guidance Document, Part 2," Environmental Protection Agency, EPA-450/2-78-014 (March 1978).

23. Schmaehl, D.F.K., "Carcinogenic Aspects of Asbestos," *World Symposium on Asbestos* (1982).

24. Sebastien, P. *et al.*, "Measurement of Asbestos Air Pollution Inside Buildings Sprayed with Asbestos," translation of document prepared for the Government of France, Ministry of Health and Ministry for the Quality of Life Environment, 1977, EPA-560/13/80-026 (Environmental Protection Agency, August 1980).

25. Selikoff, I.J. *et al.*, "Mortality Effects of Cigarette Smoking Among Amosite Asbestos Factory Workers," 65 *J. NCI* 507-513 (1980).

26. Statement by the National Institute of Building Sciences, Hearings before the Subcommittee on Public Buildings and Grounds on Potential Health Hazards Associated with the Use of Asbestos-Containing Material in Public and Private Facilities 313-15 (March 21, 1984)

27. Testimony of Dr. Hans Weill before the Ontario Royal Commission on Asbestos, Vol IX (1981).

28. Testimony of Julian Peto before the Ontario Royal Commission on Asbestos, Vol XXVA (1981).

29. Testimony of Dr. Kenny S. Crump before the Environmental Protection Agency Hearing on Asbestos in Buildings (Boston, Massachusetts, July 6, 1984).

30. Testimony of Dr. Robert N. Sawyer before the Environmental Protection Agency Hearing on Asbestos in Buildings (Boston, Massachusetts, July 6, 1984).

31. United Kingdom Advisory Committee, *Asbestos* (1979).

32. U.S. Department of Interior, Bureau of Mines, *Minerals Yearbook* (1972) and *Asbestos: A Materials Survey* (1959).

33. Wilson, R., "Analyzing the Daily Risks of Life," *Technology Review* 41-46 (Feb. 1979).